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Long-term quality of life changes after primary septorhinoplasty

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Abstract

Purpose Health-related quality of life measurements are gaining in importance in clinical medicine. Little is known about the long-term quality of life changes after septorhinoplasty. This study was designed to analyse the long-term quality of life impacts of septorhinoplasty, using disease-specific instruments—rhinoplasty outcome evaluation (ROE) and Functional Rhinoplasty Outcome Inventory-17 (FROI-17); as well as a generic instrument—Short-Form 36 Health Survey (SF-36).

Methods Patients completed the FROI-17, the ROE and the SF-36 preoperatively and at 12 and 60 months postoperatively. General demographic and clinical information (age, gender, allergies, medication, medical and surgical history) were collected from all patients.

Results We report a significant increase in disease-specific QOL after primary septorhinoplasty (as measured with the ROE & FROI-17) and in two scales of the SF-36 generic instrument (role-functioning physical and mental health) 1 year after surgery. Our patients showed further significant increase in disease-specific QOL (FROI-17) after their primary septorhinoplasty (1 year vs. 5 years postoperatively). SF-36 results showed significant improvements 5 years postoperatively (compared to preoperative scores) in six out of eight scales (physical functioning, role-functioning physical, bodily pain, vitality, social functioning and mental health).

Conclusion Septorhinoplasty can improve disease-specific and non-disease-specific QOL in the short- and long-term postoperative period. These improvements remain measurable 5 years after surgery.

Keywords Septorhinoplasty · Rhinoplasty · Quality of life · ROE · SF-36 · FROI-17

Introduction

Health-related quality of life (HRQOL) measurements are gaining increased importance in clinical medicine and outcomes research has expanded significantly in the past decades. Rhinoplasty Outcome Evaluation (ROE) [1] and the Functional Rhinoplasty Outcome Inventory-17 (FROI-17) are validated instruments for measuring HRQOL and health outcomes after septorhinoplasty [2]. However, in 5 out of 6 questions the ROE focuses on the aesthetic aspects of rhinoplasty. The FROI-17 was developed and validated to evaluate the outcome of functional and aesthetic aspects of this surgery.

In recent publications the FACE-Q scale also seems to be a useful tool for analysing patient satisfaction after septorhinoplasty [3].

Several studies have shown a short-term increase in HRQOL after septorhinoplasty—usually 6 months or 1 year [1, 4–8]. However, little is known about the long-term quality of life changes after septorhinoplasty. This study was designed to analyse the long-term effects of septorhinoplasty using both generic and disease-specific Patient Reported Outcomes Measures (PROMS).

Materials and methods

The Ethics Committee of the Medical Faculty at the University of Heidelberg granted permission to conduct the study (Project No. 409/2006). Informed consent was obtained from

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all patients. The patients were evaluated during an outpatient examination (usually 1 day before the surgery). They were asked to fill out questionnaires including two disease-specific questionnaires (FROI-17 & ROE) and one generic instrument (SF-36) The second measurement was taken during an outpatient examination 12 months after primary septorhinoplasty. The third measurement was taken either during an outpatient examination or via mail, approximately 5 years after primary surgery.

The ROE has a total of six items. Five of these six items are related solely to aesthetic aspects of septorhinoplasty and only one item assesses functional outcomes. Each response can be graded between zero (worst) and four (best). The sum of the scores is then converted into percentages with a lower score indicating more dissatisfaction. The second disease-specific questionnaire, the FROI-17, detects more functional aspects than the ROE [4] and includes 17 items, which can be graded between zero (no problem) and five (worst possible). The overall score is then transformed to a 0–100 percentage scale by dividing the sum of the raw scores of the items by the sum of ranges of the items followed by a multiplication by 100. A lower score indicates more satisfaction. The SF-36 Health Survey consists of 36 items, grouped into eight aspects: physical functioning, role-functioning physical, bodily pain, general health, vitality, social functioning, role-functioning emotional and mental health. Rules for item scoring and scales are available in the SF-36 scoring manual. Higher scores indicate a more positive rating. General demographic and clinical information (age, gender, allergies, medication, medical and surgical history) were obtained from all study participants.

Statistical analysis was performed using the JMP statistical software version 12.0.0. (SAS Institute Inc., Cary, NC, USA). Testing for significant differences between two groups of patients was performed using *t* test. The level of significance was set at $p < 0.05$. For the measurement of correlation between two samples, the Pearson correlation coefficient was used. Scores of Pearson's correlation coefficient between 0.3 and 0.5 were set as weak, between 0.5 and 0.7 as good and ≥ 0.7 as strong correlation. Moreover, the pre- and postoperative scores of the ROE, the FROI-17 and SF-36 were calculated.

Results

One hundred and two patients were enrolled in this study (51 women, 51 men). The surgery was performed by two of the authors (I.B and F.W.). Our response rate after 1 year was 67%, after 5 years 52%. At the time of surgery our patients were on average 28.7 ± 11.4 years old. All cases were primary septorhinoplasties.

All scales of FROI-17 (overall score, nasal symptoms, general symptoms and self-confidence) and the ROE overall score showed significant postoperative improvements 1 year [9] and 5 years after primary septorhinoplasty when tested against preoperative results. One year after surgery, significant postoperative improvements were detected in the role-functioning physical and mental health scales of the SF-36 [9]. Five years after septorhinoplasty, significant improvements were found in the scales physical functioning, role-functioning physical, mental health, bodily pain, vitality and social functioning. No significant changes were found between 5 and 1 year after surgery measured with the SF-36. In the postoperative 1-year versus 5-years testing, significant increases were found in the FROI-17 overall score and in the FROI-17 general symptoms subscale (Table 1).

In the correlation analysis of the SF-36 versus the two disease-specific instruments (FROI-17 and ROE), significant correlations were only found between the SF-36 and FROI-17, but not between the SF-36 and ROE [9]. Analysing the subscales of the SF-36 1-year postoperatively, good correlations were found between the FROI-17 overall score and the scales physical functioning (Pearson's correlation coefficient -0.56), role-functioning physical (-0.52), bodily pain (-0.63), general health (-0.63), vitality (-0.54), social functioning (-0.63) and mental health (-0.55). A weaker correlation was found between the scale role-functioning emotional and the FROI-17 overall score 1 year after septorhinoplasty (-0.45). The correlation analysis of the SF-36 compared with the subscale of the FROI-17 nasal symptoms and general symptoms showed good correlations. Five years postoperatively correlations between SF-36 and FROI-17 stayed significant showing good correlations.

In our study an influence of postoperative QOL in regards to open versus closed approach (closed approach 72.5%, $n = 74$; open approach 27.5%, $n = 28$) was not detectable.

Discussion

Subjective evaluation of postoperative results with special regards to patients´ satisfaction after rhinoplasty is a growing challenge [10].

Correlation analysis revealed that the correlations between the scales of the SF-36 and the FROI-17 were significantly more pronounced than the correlations between the SF-36 and the ROE [4]. This is likely due to the fact that the FROI-17 focuses also on the functional aspect of septorhinoplasty.

In some countries the national ROE score was described during a translation and validation process [9, 11]. In the score from zero to 24 of the ROE in Brazilian Portuguese, Izu et al. found 12 as the minimum normality limit, with sensitivity and specificity indices of 95.2 and 95%,

Table 1 Preoperative versus 1-year postoperative, 1-year postoperative versus 5-year postoperative and preoperative versus 5-year postoperative testing (*t* test) of the FROI-17, ROE and SF-36 scales

	Preoperatively		1-year postoperatively		5-year postoperatively		*p* (preop vs. 1-year)	*p* (preop vs. 5-year)	*p* (1-year vs. 5-year)
	Mean	SD	Mean	SD	Mean	SD			
FROI-17									
Overall score	32.2	17.5	20.2	18.3	13.7	17.3	**< 0.0001**	**< 0.0001**	**0.048**
Nasal symptoms	31.7	17.0	21.5	19.7	14.7	18.8	**0.001**	**< 0.0001**	0.05
General symptoms	32.9	22.8	20.0	20.7	12.9	17.9	**0.0002**	**< 0.0001**	**0.043**
Self-confidence	30.8	26.5	16.9	21.8	14.3	23.7	**0.0002**	**< 0.0001**	0.55
ROE									
Overall score	39.8	15.2	68.5	17.8	75.1	24.0	**< 0.0001**	**< 0.0001**	0.15
SF-36									
Physical functioning	84.0	19.4	91.4	13.3	94.4	13.3	0.05	**0.001**	0.23
Role-functioning physical	75.5	35.7	89.1	23.7	90.1	25.6	**0.02**	**0.004**	0.85
Bodily pain	80.3	26.5	83.6	23.2	89.5	22.7	0.49	**0.026**	0.26
General health	66.0	21.0	70.9	20.0	66.4	19.5	0.24	0.90	0.31
Vitality	53.1	19.6	57.2	19.6	62.8	19.7	0.30	**0.004**	0.20
Social functioning	76.0	25.2	80.5	24.6	87.5	20.7	0.38	**0.003**	0.18
Role-functioning emotional	80.2	33.4	85.4	31.6	88.7	26.9	0.43	0.09	0.63
Mental health	61.8	19.2	70.6	18.4	71.0	18.2	**0.024**	**0.004**	0.90

SD standard deviation, *p p* value, *vs* versus

respectively [11]. In the majority of studies the differences between the pre- and postoperative scores are described.

Alsaraff et al. reported an average increase in patient satisfaction after rhinoplasty of 44.5 (preoperative 38.8 to postoperative 83.3) measured with the ROE 5 months after surgery [10]. Meningeaud et al. found a mean improvement ROE score of 34, 9 months after primary rhinoplasty [6]. Hellings et al. after a follow-up of 30 months, had a mean improvement ROE score of 12 [5]. The low improvement score is most likely due to the nature of their cases being revision rhinoplasties. Faidiga et al. reported a ROE-mean score of 72.02 1 year after primary septorhinoplasty in their retrospective survey of a Brazilian patient cohort [12]. They did not evaluate preoperative scores for comparison.

Saleh et al. detected an average increase from 45.30 to 76.95 (mean improvement 31.65) measured with the ROE, with a mean follow-up period of 35.6 months in a retrospective study [7]. To our knowledge, this study represents the longest prospective follow-up of patients undergoing septorhinoplasty with both preoperative and postoperative data collection. While a retrospective study design will allow patients to assess their QOL improvement over a long period, the evaluation and interpretation of retrospective changes can be problematic due to the confounding factor of response shift bias. "Response shift bias" phenomenon can be a source of contamination of self-reported measures thus resulting in inaccurate pretest ratings [13].

We see the strength of our study in the prospective study design, use of three different questionnaires and a long follow-up period of 60 months. A weakness of the study is that we were unable to match our 1-year postoperative follow-up response rate of 67%, as response rate in this study was 52%. The disease-specific quality of life improvements mentioned in other studies are in line with our findings. A significant QOL improvement is still measureable 5 years after surgery.

An improved outcome after septorhinoplasty in the scale mental health was also found by Klassen et al. [14]. It can be argued that our cohort was predominantly young and healthy, and that therefore their mental impairment affected their physical health [4]. Another reason for our findings could be our predominantly young collective with 28.7 ± 11.4 years in average. Although Arima et al. [15] reported that patients younger than 30 years had lower satisfaction increases compared to patients over 30 years after crooked-nose surgery, Schwitzer et al. reported that rhinoplasty patients younger than 35 years old were more likely to experience enhanced satisfaction with QOL compared to patients older than 35 years measured with a disease-specific questionnaire [16]. We could not find a difference between different age groups in our cohort after 5 years. The present study suggests that in long terms the different results in these age groups are aligned.

Some studies suggest that rhinoplasty is the aesthetic surgery that has one of the lowest satisfaction rates [11, 17]. In most surgical interventions with a cosmetic aspect, experts

agree that most QOL changes will be detected within the first year after surgery [18]. However, few studies have reported outcomes for longer than 12 months. Additionally, to our knowledge only three studies measured QOL postoperatively at more than one point in time in order to detect long-term changes in QOL after aesthetic surgery. Most long-term studies showed that after 12 months, significant positive long-term effects of cosmetic surgery are no longer continuing to improve but are maintained instead [18]. In a 2-year follow-up study, Sarwer et al. reported that most improvements were detected 3 months after cosmetic surgery (breast augmentation, blepharoplasty, lipoplasty and rhinoplasty), following a maintenance through a 2-year follow-up period [19]. The second study analysing long-term QOL changes found a long-term benefit after reduction mammoplasty in 55 patients, but could not detect further QOL changes during a 2-year follow-up [20].

Flanary et al. assessed their patients´ personality pre- and postorthognathic surgery and detected at 1 and 2 years from the operation an improvement in their patients' self-confidence by 72.1 and 77%, respectively [21]. To our knowledge, this is the only study besides ours that reports additional QOL gain after 12 months postoperatively. Facial modifications are more readily apparent after surgery than modifications on other body parts [18]. At first orthognathic and septorhinoplasty surgery don't seem to have a lot in common besides their changes in facial appearance. Studies indicate that patients may acquire a number of psychosocial benefits as a result of orthognathic surgery. According to longitudinal data, the psychosocial benefits gained by patients who undergo orthognathic surgery are better social functioning, social adjustment, self-confidence, self-concept, body image, emotional stability, self-esteem, facial-attractiveness image, positive life changes and reduced anxiety [21, 22]. Septorhinoplasty not only changes the facial appearance, but also improves nasal function, resulting in an increase of HRQOL [5, 9, 23]. Our patients improved significantly in the SF-36 scales: physical functioning, role-functioning physical, bodily pain, vitality, social functioning and mental health 5 years postoperatively. Although the functional and aesthetic improvements can be seen in the short term, the positive changes in social adjustments, self-esteem and self-confidence seem to improve with a delayed response. This may be the reason why in our collective long-term HRQOL changes were detected with the FROI-17 and not the ROE, which concentrates mainly on the aesthetic aspect of septorhinoplasty.

It was reported that the final result from rhinoplasty could be seen after 12 months of follow-up [4, 10, 15]. In a previous study, patients with a longer follow-up (≥ 60 months) showed no significant differences in postoperative QOL measured with the ROE, compared with a shorter follow-up [15]. In the present study, a significant improvement after 5 years and an improvement between 1 year and 5 years after surgery was observed. We believe that a 5-year postoperative follow-up for septorhinoplasty is useful to assess long-term results. Validated disease-specific instruments should be used in further studies to evaluate the long-term effects of septorhinoplasty.

Conclusion

We found a significant increase in disease-specific QOL after primary septorhinoplasty measured with the ROE, the FROI-17 and in two scales of the non-disease-specific SF-36 (role-functioning physical and mental health) 1 year after surgery. Our patients showed further significant increase in disease-specific and non-specific QOL (testing 1 year vs. 5 years postoperatively) after 5 years. In conclusion, the study shows that septorhinoplasty can improve disease-specific and non-disease-specific QOL in the long term. These improvements can still be measured 5 years after surgery.

Author contributions All authors made substantial contributions to the study. OCB: designed and coordinated the study, participated in the data acquisition and analysis, interpreted the data and drafted the manuscript. FW: participated in the data acquisition and analysis, critically revised the manuscript for important intellectual content. DO: participated in data interpretation and revision of manuscript MP, CK and ES: participated in the data acquisition and analysis PKP: participated in the data acquisition and analysis, critically revised the manuscript for important intellectual content IB: designed and coordinated the study, participated in the data acquisition and analysis, interpreted the data, critically revised the manuscript for important intellectual content.

Compliance with ethical standards

Conflict of interest All authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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